
Space Weather Technical Forecast

Issued on Thursday, 02 February 2023 at 13:19 Local

This technical forecast provides a four day assessment of space weather events. The probabilities stated below are for reaching or exceeding the given levels. For more information about space weather impacts please see the Met Office Space Weather Scales <https://www.metoffice.gov.uk/weather/learn-about/space-weather/uk-scales>

Space Weather Forecast Headline: Slight chance of M-flares.

Analysis of Space Weather Activity over past 24 hours

Solar Activity: Activity has been Low, with C-class flares. Peak flare was C5.8 from AR3204 Cai/Beta at 01/2248 UTC. This is a small region near the northwest limb has now rotated off the disc. There are a total of five sunspot regions visible, with the only other notable region being AR3207 Dsi/Beta in the southeast. While magnetically simple, this has exhibited some slow growth. No Earth-directed CMEs have been observed on available imagery, however there are a large number of filaments on the disc which will need to be monitored for any eruption.

Solar Wind / Geomagnetic Activity: Solar wind parameters indicate a weak transient followed by the arrival of CH73/-. The speed, as observed by ACE and DSCOVR at L1 rose from 350 km/s to around 450 km/s before gradually easing back to 420 km/s, with a small jump observed around 01/1545 UTC. There was a jump in density from 10 to 20 ppcc around 01/1545 UTC before declining back to average values. The total IMF strength, Bt, was generally weak, but erratically increased from 01/1544 UTC to become moderate (8-11nT) between 01/1800-2200 before easing back to weak thereafter. The north-south component, Bz, briefly reached a southward peak of -10nT at 01/1756 UTC, before becoming persistently negative between -2nT and -6 nT from 01/2000 UTC until 02/2330 UTC. The Phi angle remained negative (towards the Sun) throughout. Geomagnetic activity was Quiet to Unsettled (Kp 0-3).

Energetic Particles / Solar Radiation: The high energy proton flux (greater than 10 MeV) as measured at GOES-16 has been at background levels throughout. High energy electron flux (greater than 2MeV) measured by GOES-16 was at background to moderate levels. The associated 24 hour electron fluence slowly increased, reaching 8.62e6 integrated pfu by 02/0000 UTC.

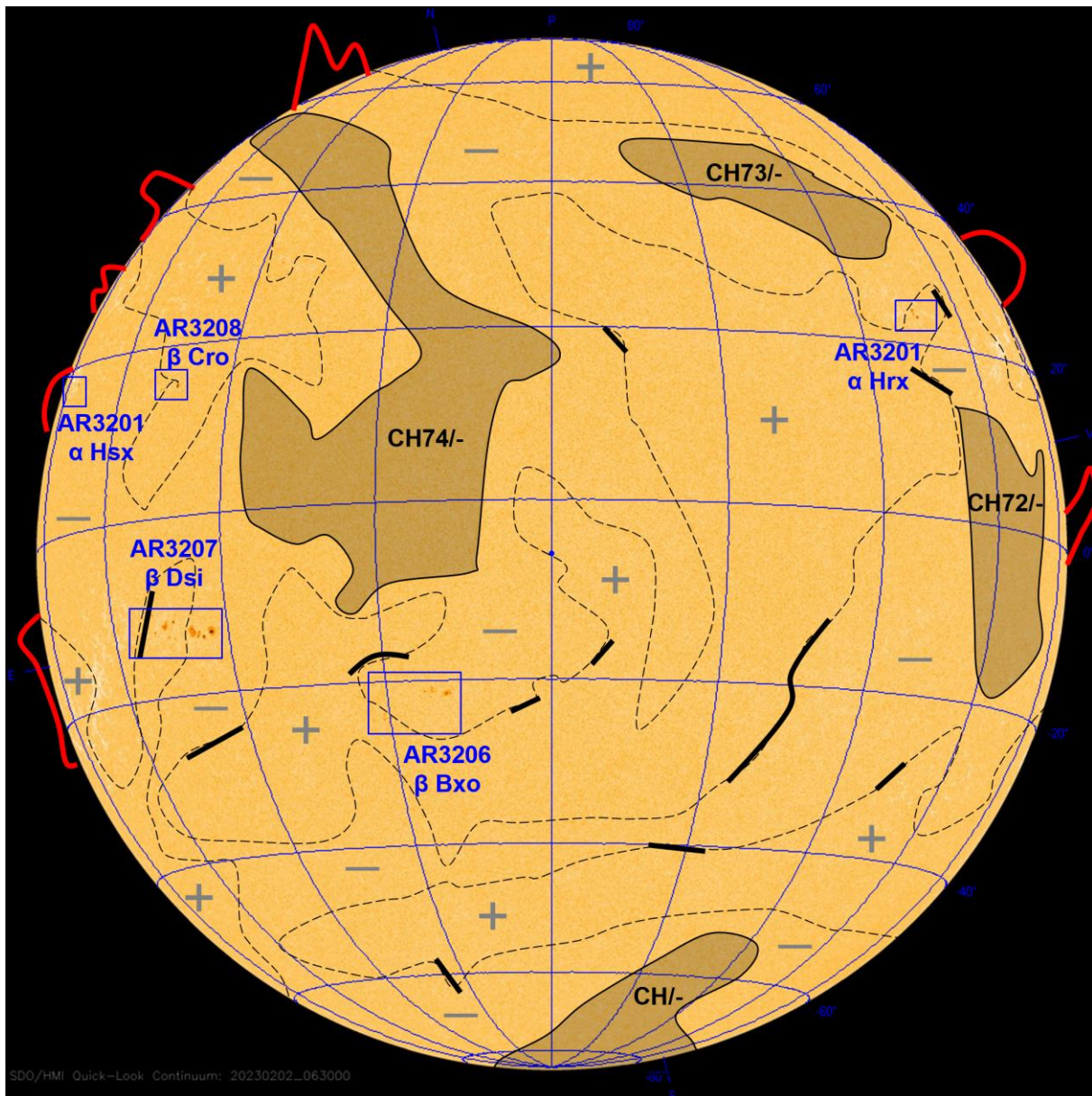
Four-Day Space Weather Forecast Summary

Solar Activity: Low activity is forecast with the sunspots on the visible disc currently small and relatively simple. There is a very slight chance of M-class flares.

Solar Wind / Geomagnetic Activity: There are no Earth-directed CMEs, although a slight glance cannot be ruled out from a CME later on day 2 (3rd), although this will likely miss. Current slightly elevated winds may become elevated for a time day 1 (2nd), due to ongoing effects of the high speed stream from CH73/. Otherwise solar winds are expected to ease through the period, before the next CIR arrival ahead of CH74, likely later day 3 (4th) or more likely day 4 (5th). Geomagnetic activity is expected to be mainly Quiet to Unsettled with a chance of Active intervals. There is a slight chance of G1/Minor Storms, mainly day 1 (2nd) and day 4 (5th).

Energetic Particles / Solar Radiation: The high energy (greater than 10 MeV) proton flux observed by GOES16 is expected to remain at background levels. Electron flux is expected to be at background or moderate levels. Electron fluence is expected to remain below the Active (1e8 integrated pfu) threshold.

Figure 1. Solar Analysis Valid 02/0630 UTC.



Key: Filament ____, Prominence ____, Magnetic Field Line - - -, Polarity +/-, Coronal Holes: Grey shaded area CHxx +/-, Sunspot groups 25xx - Mt Wilson α - β - β - β - γ - δ and Zurich-McIntosh Axx etc.

Geomagnetic Storms:

There are no Earth-directed CMEs, however a CME that is expected to pass north and ahead of Earth may glance later on the 3rd. However, confidence is very low with the analysis of this feature.

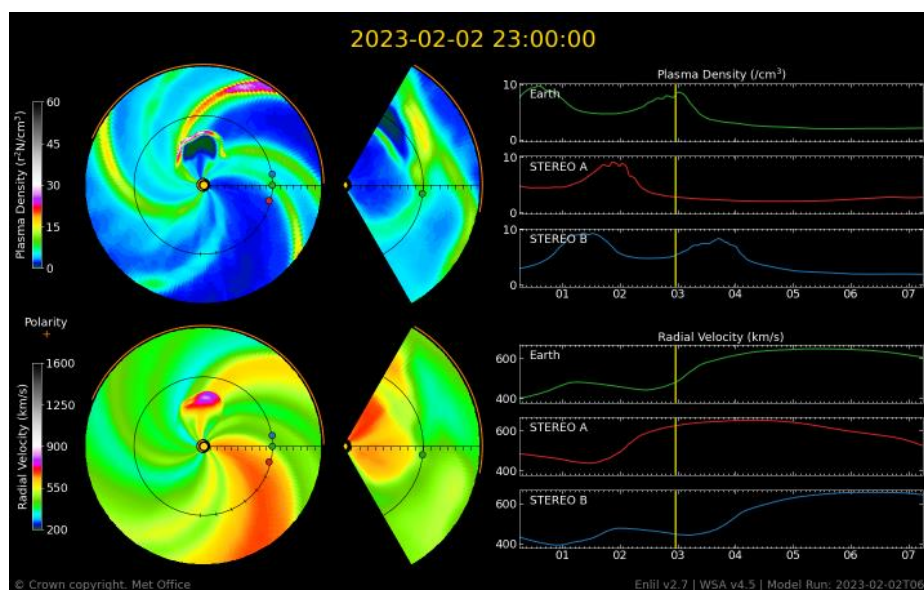
Enhancements observed in the geospace environment on 1st Feb are likely due to some interaction with the passing fast wind of CH73, in the north disc, perhaps coupled with a weak passing transient. Solar winds are likely to remain rather variable, with an overall easing trend probable.

Enlil winds indicate a potential further enhancement on 3rd, but is likely due to an over-estimation of the size of CH74 in the east disc, with the following enhancement indicated in the model not expected until the end of the period, later on 4th or more likely on 5th.

Geomagnetic activity is expected to be mainly Quiet to Unsettled throughout, with a chance of Active intervals. There is slight chance of G1/Minor Storms throughout. On day 1 (2nd) this is due to ongoing fast wind effect. On day 2 and day 3 (3rd or 4th) there is the potential glancing CME before any CIR arrival likely occurs ahead of CH74 HSS later on day 3 or into day 4 (4th or 5th).

Geo-Magnetic Storm	Level	Past 24 Hours (Yes/No)	Day 1 (00-24 UTC)	Day 2 (00-24 UTC)	Day 3 (00-24 UTC)	Day 4 (00-24 UTC)
Probability (Exceedance)			(%)	(%)	(%)	(%)
Minor or Moderate	G1 to G2	No	10	5	10	20
Strong	G3	No	1	1	1	1
Severe	G4	No	1	1	1	1
Extreme	G5	No	1	1	1	1

Figure 2: MOSWOC ENLIL





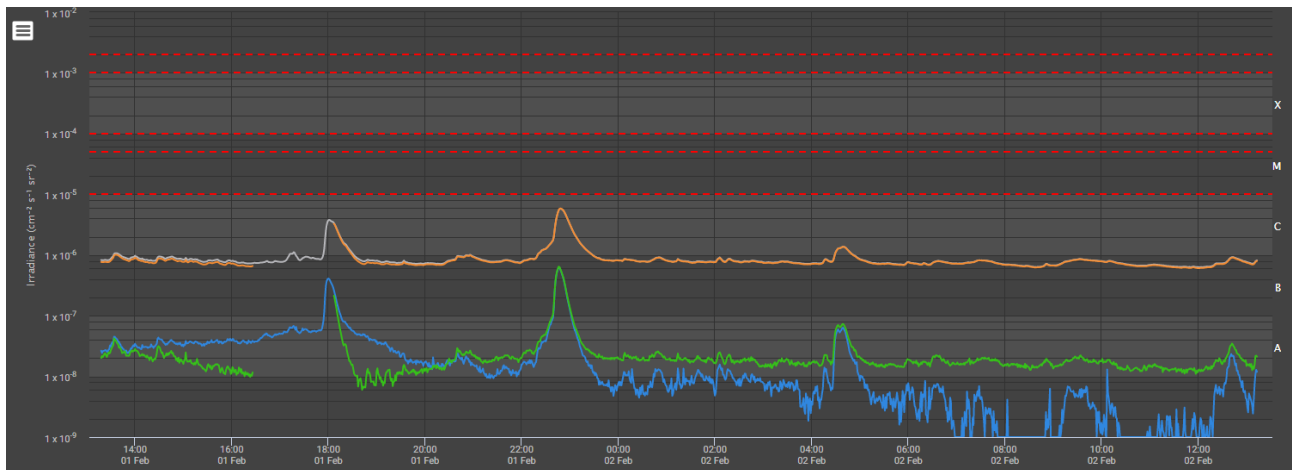
Radio Blackouts - X-Ray Flares:

There are five sunspot regions on the visible disc, however these are all small and magnetically simple. The most notable region is AR3207 in the southeast which is in the southeast disc, and has been showing some slow growth in the last 24 hours. Activity is expected to remain Low with only a slight chance of increasing to Moderate with any M-flares that occur.

STEREO A euvi imagery and the expected return of ex-AR3193 and ex-AR3184, suggest the potential for a returning regions onto the southeast within the next 48 hours. This is supported by helioseismic data, which shows the potential for regions to rotate onto the disc through the period.

X Ray Flares	Level	Past 24 Hours (Yes/No)	Day 1 (00-24 UTC)	Day 2 (00-24 UTC)	Day 3 (00-24 UTC)	Day 4 (00-24 UTC)
Probability			(%)	(%)	(%)	(%)
Active	R1-R2 M Class	No	10	10	10	10
Very Active	R3 to R5 X Class	No	1	1	1	1

Figure 3: X-Ray trace past 24 hours



Solar Radiation Storms - (High Energy Protons):

High energy (greater than 10MeV) proton flux as observed by GOES16 is currently expected to persist at background levels.

Radiation Storms	Level (cm ⁻² sr ⁻¹ s ⁻¹)	Past 24 Hours (Yes/No)	Day 1 (00-24 UTC)	Day 2 (00-24 UTC)	Day 3 (00-24 UTC)	Day 4 (00-24 UTC)
Probability (Exceedance)			(%)	(%)	(%)	(%)
Active	≥ S1	No	1	1	1	1
Very Active	≥ S3 [*]	No	1	1	1	1

^{*} S3 ≥ 10 MeV ≥ 1000 pfu and / or ≥ 50 MeV ≥ 10 pfu. (pfu = cm⁻²sr⁻¹s⁻¹)

High Energy Electrons Event (≥ 2MeV):

High energy electron flux (greater than 2MeV) as observed by GOES-16 is expected to oscillate between moderate and background levels through the next four days, with only a very slight chance of rising to high on day 2 and day 3 (3rd and 4th) as solar winds ease. Although any periods of geomagnetic activity may act to suppress these values further.

Electron fluence is at low levels with any rise over the next four days expected to be modest, and remaining below the Active (1e8 integrated pfu) threshold. This is supported by REFM, although this is of limited value as this has yet to account for current solar wind enhancement.

GEO Electron Environment	Level (cm ⁻² sr ⁻¹ day ⁻¹)	Past 24 Hours (Yes/No)	Day 1 (00-24 UTC)	Day 2 (00-24 UTC)	Day 3 (00-24 UTC)	Day 4 (00-24 UTC)
Probability (Exceedance)			(%)	(%)	(%)	(%)
Active	≥ 2 MeV ≥ 1x10 ⁸	No	1	10	10	10
Very Active	≥ 2 MeV ≥ 1x10 ⁹	No	1	1	1	1

Figure 4: Electron flux past 24 hours.

